

Flexible Supercapacitors for Biomedical Applications

Srinivasan, G., & Lorenzo Fernandez, M. (2017). *Flexible Supercapacitors for Biomedical Applications*. Poster session presented at Faraday Discussion 154, Cambridge, United Kingdom.

Document Version:

Publisher's PDF, also known as Version of record

Queen's University Belfast - Research Portal:

[Link to publication record in Queen's University Belfast Research Portal](#)

Publisher rights

Copyright 2017 The author.

General rights

Copyright for the publications made accessible via the Queen's University Belfast Research Portal is retained by the author(s) and / or other copyright owners and it is a condition of accessing these publications that users recognise and abide by the legal requirements associated with these rights.

Take down policy

The Research Portal is Queen's institutional repository that provides access to Queen's research output. Every effort has been made to ensure that content in the Research Portal does not infringe any person's rights, or applicable UK laws. If you discover content in the Research Portal that you believe breaches copyright or violates any law, please contact openaccess@qub.ac.uk.

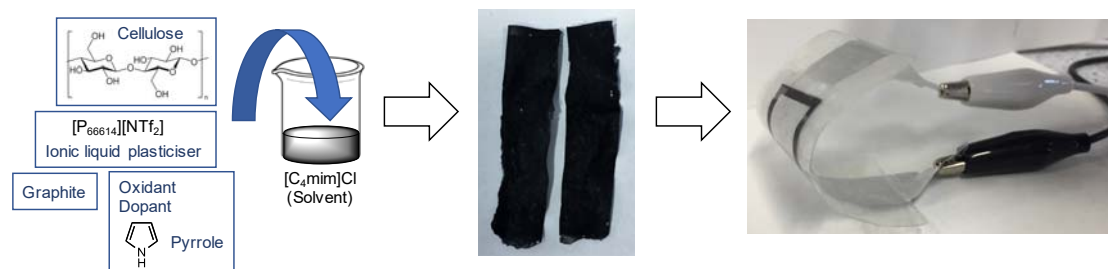
Flexible Supercapacitors for Biomedical Applications

Marta Lorenzo*, Geetha Srinivasan

School of Chemistry and Chemical Engineering, The QUILL Research Centre, David Keir Building, Queen's University Belfast, Stranmillis Road Belfast BT9 5AG, UK
mlorenzofernandez01@qub.ac.uk

There is an urging need to develop flexible, ultrathin and safe energy storage devices to “power-up” bioelectronics and implantable biomedical devices. To address this issue, we approached the development of supercapacitors that are flexible and biocompatible using the multifunctional role of ionic liquids (ILs). The main challenge to design such supercapacitors to be flexible lies in the development of flexible electrodes and leak proof solid-state electrolytes that should retain characteristics of high power density, long cycle life and high efficiency.^{1,2}

The current work presents the development of flexible electronic materials consisting of biopolymer, conducting polymer and IL composites as electrodes.³ Fabrication of three energy storage devices viz. (i) electrochemical supercapacitor, (ii) electrical double-layer and (iii) hybrid supercapacitor have been carried out and their electrochemical properties were investigated using cyclic voltammetry, galvanostatic charge-discharge and electrochemical impedance spectroscopy. The chemical and morphological nature of these composite electrodes before and after the cycling process was studied using vibrational spectroscopy and electron microscopy to develop a scientific understanding on the stability of these devices for biomedical applications.⁴ These new flexible supercapacitors showed specific capacitance values around 4 mF g⁻¹ which will be sufficient to activate biosensors and possess long cycle life of >15000 cycles with nearly 100% efficiency. This discovery opens up a novel platform of research on next-generation energy devices.



1. X. Lu, M. Yu, G. Wang, Y. Tong and Y. Li, *Energy Environ. Sci.*, 2014, **7**, 2160.
2. W. K. Chee, H. N. Lim, Z. Zainal, N. M. Huang, I. Harrison and Y. Andou, *J. Phys. Chem. C*, 2016, **120**, 4153.
3. M. Lorenzo, B. Zhu and G. Srinivasan, *Green Chem.*, 2016, **18**, 3513.
4. X. Jia, C. Wang, V. Ranganathan, B. Napier, C. Yu, Y. Chao, M. Forsyth, F. G. Omenetto, D. R. MacFarlane and G. G. Wallace, *ACS Energy Lett.*, 2017, **2**, 831.